MADANAPALLE INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC - AUTONOMOUS)

A Report
on
Five-Day Faculty Development Programme
"AICE 2025: Advances in Intelligent Civil Engineering"
10.09.2025 to 14.09.2025

Report Submitted by: **Department of Civil Engineering, MITS.**
Co-ordinators:
1. Dr. Nunna Tagore Sai Priya, Assistant Professor
2. Dr. Nakkeeran G, Assistant Professor
3. Dr. Vishal Singh Rawat, Assistant Professor

Event Name: Five-Day Faculty Development Programme on "AICE 2025: Advances in Intelligent Civil Engineering"

Resource Persons:

1. **Dr. Dipankar Roy, Dean (School of Engineering), MITS (deemed to be University)**
2. **Dr. Bharath H Aithal, RCGSIDM, IIT Kharagpur**
3. **Dr. Arkopal Kishore Goswami, RCGSIDM, IIT Kharagpur**
4. **Dr. Chandan M C, Dept. of Water resources and Ocean Eng., NITK Surathkal**
5. **Dr. Eeshan Bhaduri, Post Doctoral Fellow, University of Leeds, UK**
6. **Dr. Sudeep Banad, Associate Hydrologist, WELL LABS, Bengaluru**
7. **Dr. Prasanna Kumar Behera, Dept. of Civil Eng., IIT Tirupati**
8. **Dr. Roshni T, Dept. of Civil Eng., NIT Patna**

Participants:
Faculty and Research Scholars from various Institutions across India – 301

Mode of Conduct: **Hybrid**

The Department of Civil Engineering successfully organized a Faculty Development Program (FDP) focused on the transformative role of Artificial Intelligence (AI) and Machine Learning (ML) in modern civil engineering practices. The program addressed pressing challenges such as urbanization, climate change, and infrastructure demands by showcasing data-driven solutions that enhance design precision, predictive analysis, and decision-making.

Key sessions explored the integration of AI/ML in structural health monitoring, hydrology, geoinformatics, transportation systems, and environmental assessment. Participants gained hands-on experience with tools like Google Earth Engine, remote sensing platforms, and open-source software for sustainable infrastructure development.

The FDP fostered interdisciplinary collaboration and equipped faculty members with cutting-edge methodologies essential for advancing civil engineering in the era of smart cities and intelligent systems.

Welcome Address:

The Faculty Development Programme (FDP) commenced with a warm and engaging welcome address delivered by Dr. Nunna Tagore Sai Priya. She introduced the participants to the institute's department, highlighting its academic vision and achievements, and provided an overview of the FDP programme, emphasizing its relevance and objectives in the current educational landscape.

Inauguration of the event:

The FDP was formally inaugurated by Dr. C. Yuvaraj, Vice Chancellor of MITS – Deemed to be University. In his inaugural speech, Dr. Yuvaraj underscored the critical importance of integrating Artificial Intelligence (AI) and Machine Learning (ML) into core engineering disciplines. He emphasized how these technologies are reshaping traditional engineering practices and encouraged faculty members to embrace innovative teaching methodologies to prepare students for the evolving tech-driven world.

Session 01: (Sep 10, 2025 – 2.30 to 4.30 pm) **Attendees: 291**

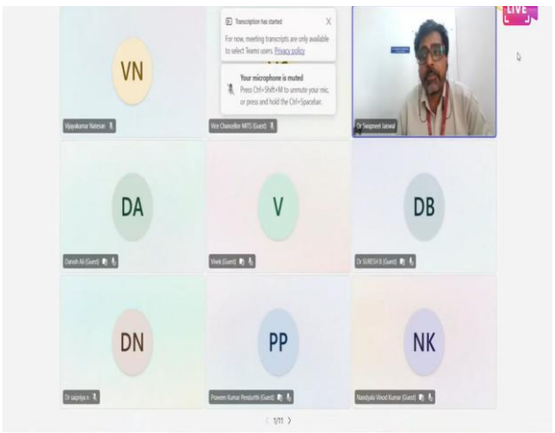
Session Chair: Dr. Swapneel Jaiswal, Assistant Professor, Dept. of Civil Eng...

Speaker: Dr. Dipankar Roy

Topic: AI Applications in Civil Engineering

The session was **chaired by Dr. Swapneel Jaiswal**, who facilitated the discussion and highlighted the importance of interdisciplinary collaboration in driving innovation within civil engineering.

The inaugural technical session was delivered by **Dr. Dipankar Roy**, who provided deep insights into the **integration of Artificial Intelligence (AI) and Machine Learning (ML)** in civil engineering. His talk covered emerging trends, practical applications, and research opportunities in areas such as **structural health monitoring**, **smart construction technologies**, and **predictive maintenance**. He emphasized how intelligent systems are transforming traditional engineering workflows and enhancing decision-making in infrastructure development.



The session was streamed live on YouTube, and the link to access the session is provided below
Day-1(Session 1): https://www.youtube.com/live/BKbv6dv1wAg?si=JdF_aPlrG9AO47GX

Session 2a: (Sep 11, 2025 – 10.30am to 12.30pm) Attendees: 212
Session Chair: Dr. Sudheer Kumar Y, Associate Professor, Dept. of Civil Eng...
Speaker: Dr. Bharath H Aithal, Associate Professor, RCGSIDM, IIT Kharagpur
Topic: Remote Sensing and Machine Learning Applications

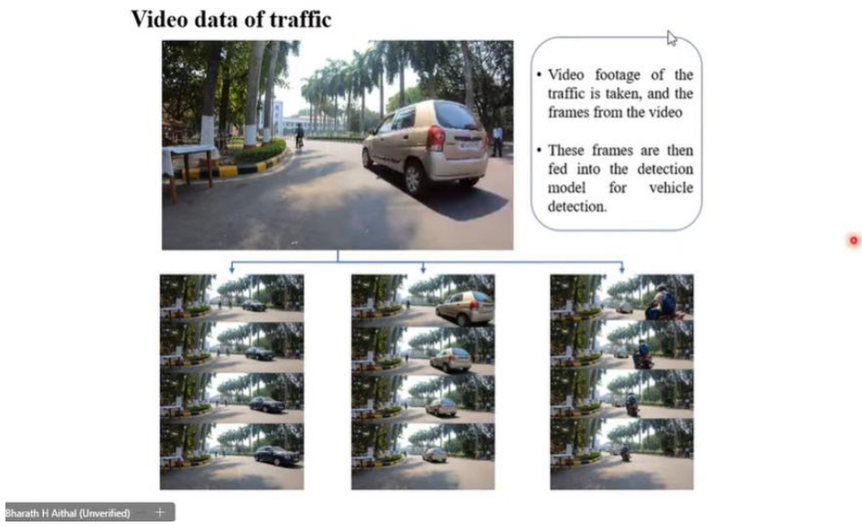
The session was chaired by Dr. Sudheer Kumar Y, who welcomed the participants and introduced the Speaker, Dr.Bharath H Aithal and his expertise in remote sensing, geospatial analytics, and Machine learning applications in urban modeling.

Dr. Bharath has delivered a talk focusing on the integration of remote sensing and machine learning technologies in addressing urbanization challenges within civil engineering. He also provided insights on the dynamics of urban growth in Indian cities and showcased innovative geospatial and AI-driven approaches for smart city planning and infrastructure management. He demonstrated the use of geospatial tools, AI, IoT, and machine learning models (SLEUTH, deep learning, and cellular automata) for predicting urban growth, land surface temperature analysis, building and road extraction, and traffic monitoring. The session concluded with the concept of Urban Observatories and Smart Campuses, showcasing IIT Kharagpur's IoT-based real-time monitoring initiative.

Key Highlights of the session:

- ✓ Rapid urban growth issues: sprawl, infrastructure gaps, environmental degradation, urban heat islands
- ✓ Geospatial and AI tools for urban monitoring and planning
- ✓ **Bangalore case study** on lake encroachments, flooding, and applications of SLEUTH, ML, PSO in predictive modelling.
- ✓ Climate impact analysis via land surface temperature
- ✓ Deep learning for 3D building and road network extraction
- ✓ Traffic and mobility studies using computer vision
- ✓ Concept of **Urban Observatories** and **Smart Campuses**
- ✓ IIT Kharagpur's real-time urban monitoring using IoT and geospatial data

In his concluding remarks and vote of thanks, Dr. Sudheer Kumar Y described the session as transformative, emphasizing its potential to expand the boundaries of conventional civil engineering. He highlighted the relevance of emerging concepts such as ribbon development, smart infrastructure, and the importance of interdisciplinary collaboration in tackling future urban challenges.



The session was streamed live on YouTube, and the link to access the session is provided below:
Day-2(Session 2a): https://www.youtube.com/live/KAaBtYsWbT0?si=1xFe-cZ5OIMwIze1

Session 2b: (Sep 11, 2025 – 2.30pm to 4.30pm) **Attendees: 206**
Session Chair: Dr. Priyam Nath Bhowmik, Assistant Professor, Dept. of Civil Eng...
Speaker: Dr. Arkopal Kishore Goswami, Associate professor & Chairperson, RCGSIDM, IIT Kharagpur
Topic: The Role of Urban Transport Electrification

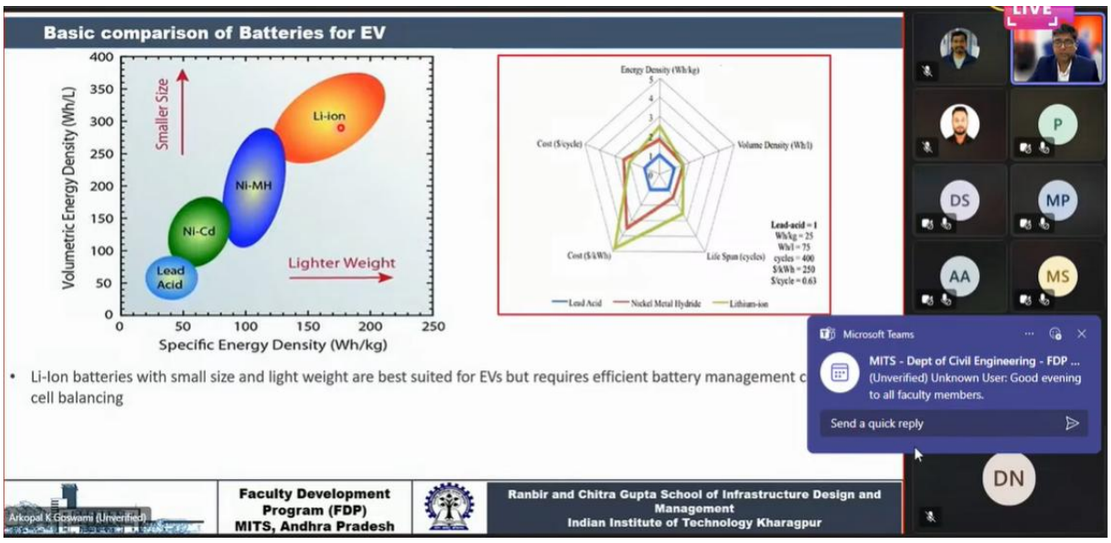
The session commenced with Dr. Priyam Nath Bhowmik introducing the keynote speaker, Dr. Arkopal Kishore Goswami, and outlining the theme of the session—urban transport electrification.

Dr. Goswami's presentation focused on the transformative impact of electric mobility in shaping sustainable urban infrastructure, reducing carbon emissions, and driving innovation in city planning. He delved into the integration of technology, policy frameworks, and organizational strategies, emphasizing the need for departmental alignment with broader institutional goals. His insights highlighted how electrified transport systems can serve as a catalyst for smarter, greener cities.

Key Highlights of the session:

- ✓ *Data-driven decision-making*: Leveraging analytics and metrics for effective planning
- ✓ *Adaptability and innovation*: Embracing change in dynamic urban environments
- ✓ *Leadership and collaboration*: Fostering transparency, motivation, and team synergy
- ✓ *Case studies* of successful transport electrification initiatives

The session also includes Interactive discussions among participants on various challenges and best practices on Transport electrification. Dr. Bhowmik concluded the session with his vote of thanks and emphasized the need for continuous learning and interdisciplinary cooperation to drive sustainable urban mobility. The session left attendees with actionable insights to enhance leadership, planning, and implementation in their respective domains.



The session was streamed live on YouTube, and the link to access the session is provided below.
Day-2(Session 2b): https://www.youtube.com/live/XfDCAhaGGRg?si=oyOdrbrrrQ_q6MHG

Session 3a: (Sep 12, 2025 – 10.30am to 12.30pm) **Attendees: 224**
Session Chair: Mr. Sabarish Kumar P, Assistant professor, Dept. of Civil Eng...
Speaker: Dr. Roshini, Assistant professor, Dept. of Civil Eng., NIT Patna
Topic: Application of AI in Water Resources

The session commenced with a warm welcome and introduction by Mr. Sabarish Kumar P, who highlighted Dr. Roshni T's expertise in computational modeling and bibliometric analysis—two pillars of modern civil engineering research.

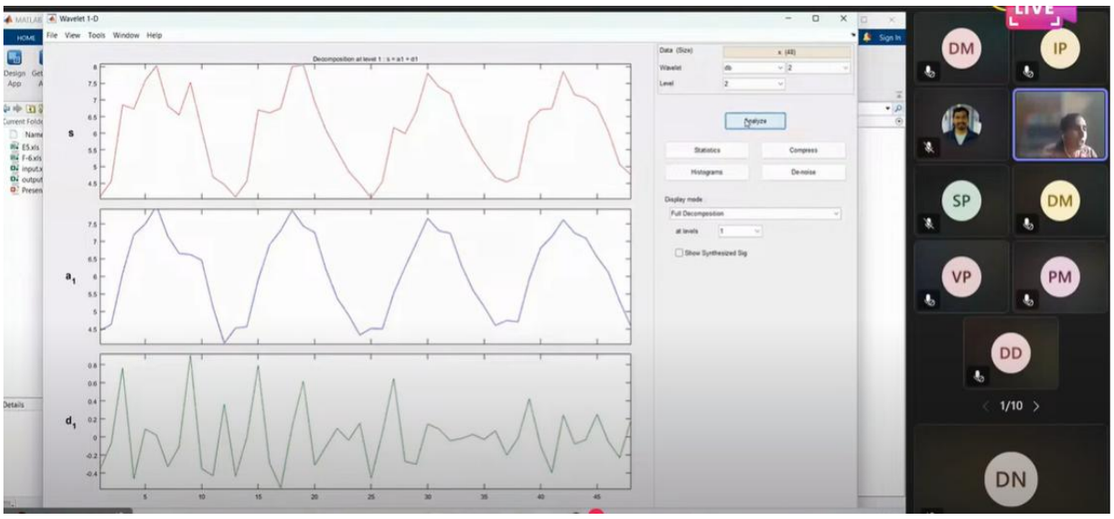
Dr. Roshni's presentation offered a hands-on exploration of MATLAB applications, focusing on wavelet decomposition and coherence for data preprocessing in water resource engineering. She demonstrated how these techniques enhance neural network modeling, particularly in hydrogeological scenarios, enabling more accurate predictions and deeper insights. The session also emphasized the value of review-based and bibliometric analysis, guiding participants on how to use tools like VOS Viewer to identify research gaps, analyze trends, and publish impactful papers—especially useful for early-career researchers.

Key Highlights of the session:

- ✓ *MATLAB Demonstrations*: Practical walkthroughs of wavelet analysis and its integration with neural networks for groundwater studies.
- ✓ *AI & Research Strategy*: Insights into using AI tools like ChatGPT for model development and customizing code for departmental goals.
- ✓ *Bibliometric Tools*: Introduction to VOS Viewer and R packages for mapping literature and identifying future research directions.

The session has opened an engaging discussion on algorithm selection, heatmap visualization, and ethical use of AI in academic writing.Mr. Sabarish Kumar P expressed heartfelt gratitude to Dr. Roshni for her insightful and accessible presentation. He praised her clear explanation of neural networks and backpropagation, and the practical value of MATLAB case studies integrating wavelet analysis. He noted that the introduction of bibliographic analysis opened new dimensions of learning, equipping participants with powerful tools to explore references, trends, and future directions in civil engineering research. The session

concluded on a high note, leaving attendees inspired and better prepared to apply these techniques in their academic and professional pursuits.



The session was streamed live on YouTube, and the link to access the session is provided below.
Day-3(Session 3a): https://www.youtube.com/live/sGTHL32D0iE?si=dmK1tJzMAFOSNhKq

Session 3b: (Sep 12, 2025 – 2.30pm to 4.30pm) **Attendees: 236**
Session Chair: Dr. Vijayakumar Natesan, HoD, Dept. of Civil Eng...
Speaker: Dr. Chandan M C, Assistant professor, Dept. of Water Resources and Ocean Engineering, NITK Surathkal
Topic: Application of AI in Water Resources

The session was chaired by Dr. Vijayakumar Natesan, Professor, Dept. of Civil Engineering, MITS, who welcomed the participants and introduced the resource person, Dr. Chandan M.C., Faculty at NIT Suratkal, emphasizing his expertise in geoinformatics, hydrological modeling, SWAT+, remote sensing, urban growth modeling, and spatial decision support systems.

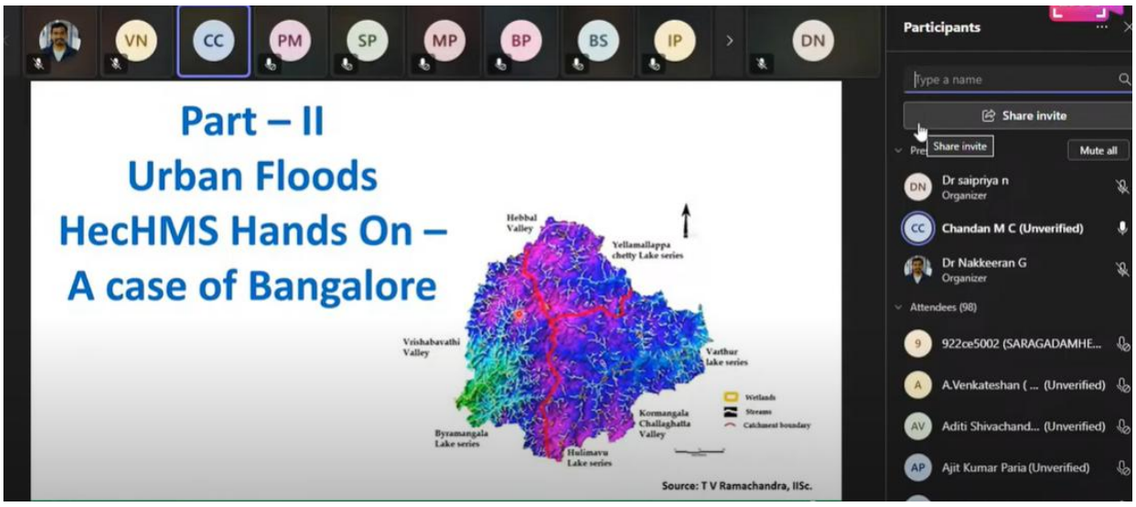
Dr. Chandan M.C. delivered an in-depth presentation on the SWAT+ model and its applications in simulating hydrological processes, especially in urban contexts. He explained watershed dynamics, water balance components, and the role of remote sensing in flood prediction. A case study on Bengaluru's Rushabhavathi valley illustrated urban flood modeling using HEC-RAS and satellite data. The session included a practical demonstration of model setup, calibration, and visualization techniques.

Key Highlights of the session:

- ✓ *Hydrological Modeling Concepts:* Water cycle components, watershed boundaries, and runoff dynamics and Importance of boundary conditions and system inputs/outputs
- ✓ *SWAT+ Model Overview:* Open-source tool for simulating flow, sediment, and nutrient transport, Requires DEM, land use, soil, and climate data, Uses Hydrological Response Units (HRUs) for detailed analysis
- ✓ *Urban Flood Simulation:* Case study using HEC-RAS for Bengaluru, Impact of urbanization, lake encroachment, and poor drainage, Use of Sentinel-1 SAR data for flood monitoring

- ✓ Practical Demonstration on DEM preparation, watershed delineation, and geometry setup and Simulation of flood depth and velocity across return periods

Concluding the session, Dr. Vijayakumar Natesan emphasized the critical relevance of the session to India's ongoing flood challenges, highlighting the urgent need for advanced hydrological modelling and geospatial tools in future urban infrastructure planning. He expressed his vote of Thanks to Dr. Chandan M.C. for his insightful presentation and practical demonstrations, which provided valuable knowledge on integrating SWAT+ and remote sensing techniques for flood prediction and watershed management.



The session was streamed live on YouTube, and the link to access the session 3b is provided below.

Day-3(Session 3b): https://www.youtube.com/live/nuy_voW_2R8?si=PwW5XIX4XkbBHHbJ

Session 4a: (Sep 13, 2025 – 10.30am to 2.30pm) Attendees: 211
Session Chair: Mrs. Anitha K, Assistant Professor, Dept. of Civil Eng...
Speaker: Dr. Eeshan Bhaduri, Post Doctoral Fellow, Institute for Transport Studies - University of Leeds, UK
Topic: Travel Behavioural Modelling

The session was chaired by Mrs. Anitha who welcomed the participants and the resource person, Dr. Eeshan Bhaduri, highlighting his expertise in travel behavior modeling, sustainable transport, and emerging mobility systems.

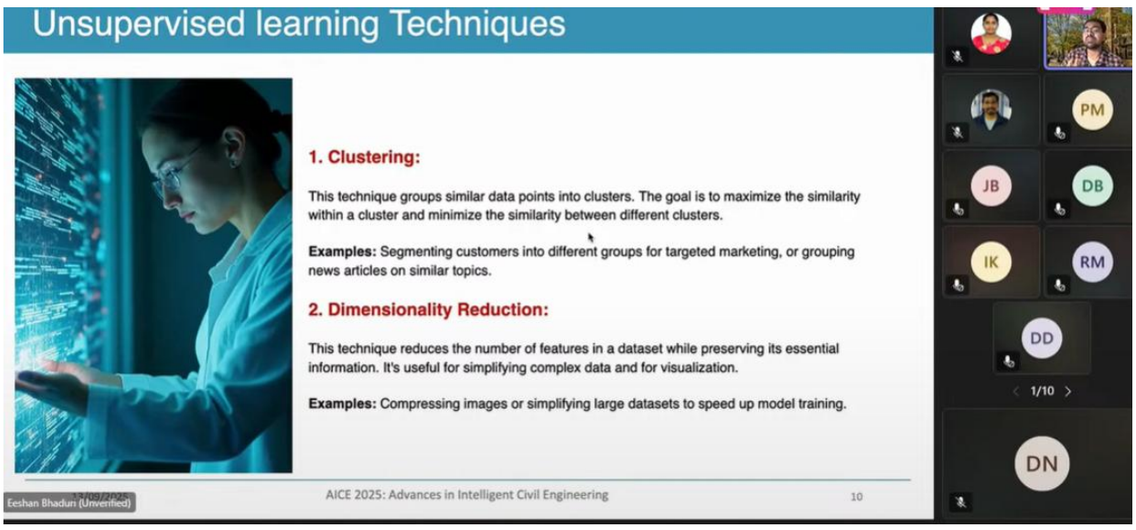
Dr. Bhaduri delivered an insightful lecture on the application of data science in travel behavior modeling, highlighting the growing role of big data, machine learning, deep learning, and AI in shaping intelligent and adaptive transport systems.He discussed the use of large-scale social media datasets and mobile GPS data to analyze travel patterns. He provided insights into sentiment analysis, clustering, and topic modeling, demonstrating how perceptions evolve over time and differ across geographies. His talk emphasized how data-driven approaches can improve sustainable transport policies, guide infrastructure development, and shape equitable mobility solutions for the future.

Key Highlights of the session:

- ✓ Applications of supervised, unsupervised, and reinforcement learning in transportation planning
- ✓ Case studies involving Twitter data to examine public perceptions of futuristic mobility, including urban air mobility (flying cars) and autonomous vehicles, across multiple countries

- ✓ Practical considerations for handling noise in datasets, survey bias, and methodological challenges in transport research
- ✓ A resilience study using flow indices and clustering techniques to evaluate how urban mobility systems respond and recover during disruptions like extreme weather events

The session concluded with an engaging Q&A, where participants raised queries on model accuracy, practical applications in civil engineering. Finally, Mrs. Anitha delivered the vote of thanks, expressing deep gratitude to Dr. Bhaduri for sharing his expertise on Travel behaviour modelling and use of big data in transportation planning. She warmly thanked all participants, all the participants for their active involvement, which made the event meaningful and engaging.



The session was streamed live on YouTube, and the link to access the session 3b is provided below.

Day-4(Session 1): https://www.youtube.com/live/0wUjCHzdXUA?si=-dNfT4cyr4yKTKX2

Session 4b: (Sep 13, 2025 – 2.30pm to 4.30pm) Attendees: 209
Session Chair: Mr. Imran Kuttagola, Assistant Professor, Dept. of Civil Eng...
Speaker: Dr. Prasanna Kumar Behera, Assistant Professor, Dept. of Civil Eng., IIT Tirupati
Topic: Health Monitoring of Civil Structures

The session was chaired by Mr. Imran Kuttagola, Assistant Professor, MITS, who welcomed the gathering and introduced the distinguished speaker, Dr. Prasanakumar Bhara, Assistant Professor, IIT Tirupati.

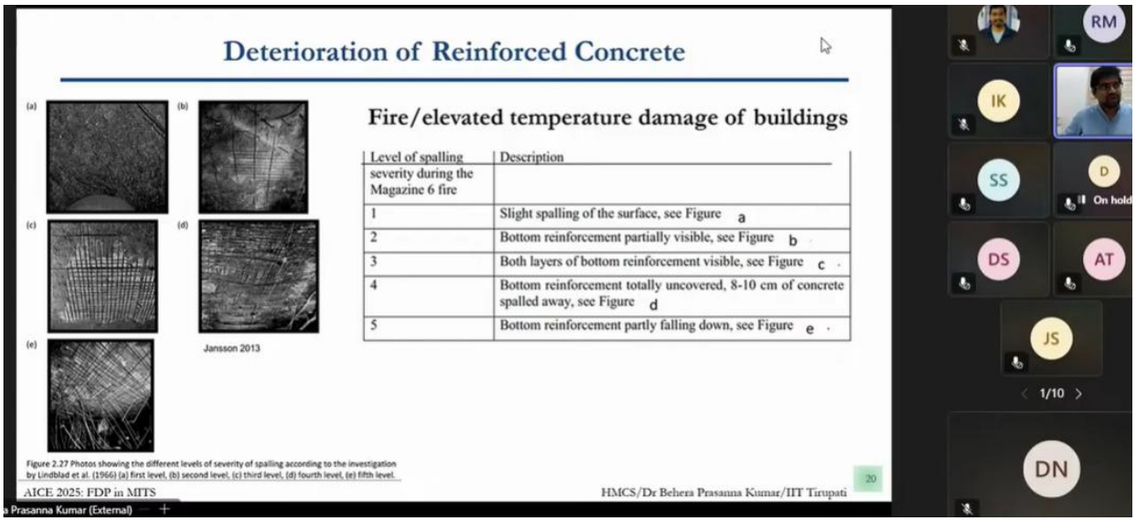
Dr. Prasanna Kumar Behera's session shed light on the importance of structural health monitoring, drawing a compelling analogy with medical diagnostics. He explained that non-destructive testing (NDT), preventive maintenance, and advanced sensing techniques are essential for ensuring the long-term performance and safety of infrastructure.

Key Highlights of the session:

- ✓ Deterioration mechanisms in reinforced concrete.
- ✓ Non-destructive and electrochemical testing methods.
- ✓ Root-cause-based repair and retrofitting strategies.
- ✓ Modern approaches using IoT, fiber optic sensors, and real-time monitoring.
- ✓ The necessity of preventive maintenance for sustainability.

The interactive discussion featured participant queries on the role of IoT, testing relevance in academic labs, impact of rebars on NDT results, and potential of

geopolymer materials in repair works. Dr. Behara offered detailed insights and practical suggestions. The session concluded with a formal vote of thanks extended by the chairperson, Mr. Imran Kuttagola, appreciating the valuable contributions of the speaker, the encouragement of management, and the active participation of faculty members.



The session was streamed live on YouTube, and the link to access the session 3b is provided below.

Day-4(Session 4a): https://www.youtube.com/live/EUr729x6BCs?si=3ZgvvWG4o1ilxLFX

Session 5: (Sep 14, 2025 – 10.30am to 12.30pm) Attendees: 260
Session Chair: Mr. Veeresh B, Assistant Professor, Dept. of Civil Eng...
Speaker: Dr. Sudeep Banad, Associate Hydrologist, WELL LABS, Bengaluru
Topic: Water security indicators using open source geospatial data

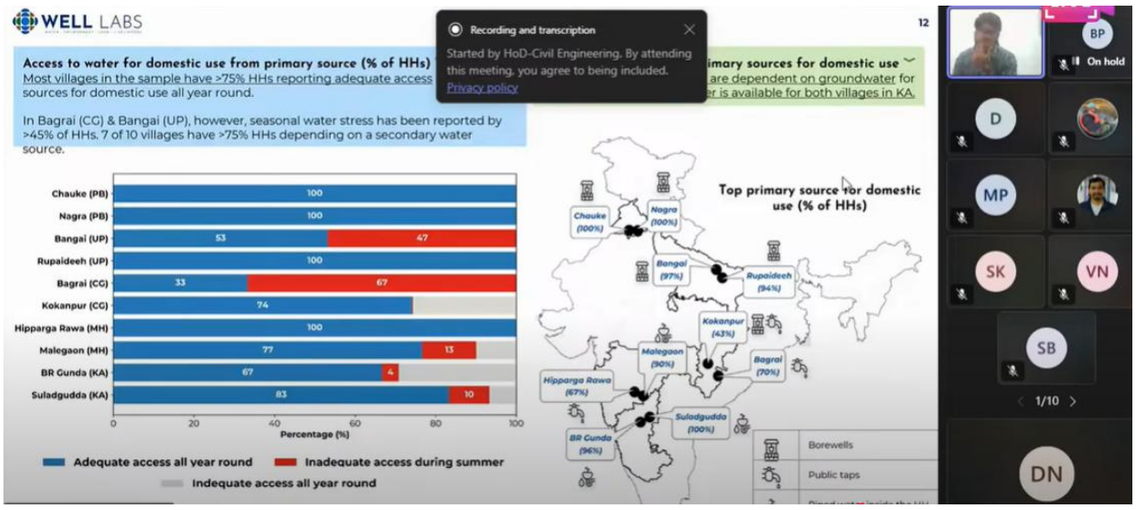
The session was chaired by Mr. Veeresh B, who warmly welcomed the participants and set the tone for an engaging discussion. He introduced the resource person, Mr. Sudeep Banad whose expertise lies in utilizing open-source geospatial data to develop water security indicators, emphasizing the relevance of his work in addressing contemporary challenges in water resource management and sustainable development.

Mr. Banad drew parallels between human health checkups and watershed health assessments, highlighting the urgent need for annual "water health checkups" to address India's growing challenges in water quality, access, and resilience. He also introduced the WISER framework, a multidimensional tool designed to evaluate water security through indicators such as balance, access, quality, productivity, resilience, and governance.

Key Highlights of the session:

- ✓ *Holistic Water Security:* Balancing domestic, agricultural, ecological, and livelihood needs.
- ✓ *WISER Framework:* A structured approach to assess watershed health and guide policy.
- ✓ *Field Insights:* Surveys across five states revealed disparities in irrigation, cropping resilience, and groundwater sustainability.
- ✓ *Technological Integration*: Use of remote sensing, GIS mapping, and mobile apps to generate watershed scorecards.
- ✓ *Policy Alignment:* Shift from infrastructure-based inputs to outcome-based water planning, echoing ASER-style reforms.

Participants actively discussed remote sensing applications, groundwater monitoring, and climate variability. Mr. Banad demonstrated scalable methods using Sentinel satellite data, CGWB reports, and NDWI indices. The session concluded with reflections on the need for sustainable and outcome-oriented water management. The proposed WISER framework promises to guide government agencies, NGOs, and researchers in building resilient water systems for India. Mr. Veeresh B, in his closing remarks commended the practical insights, policy relevance, and technological clarity, He acknowledged the session's contribution to sustainable water management and thanked participants for their enthusiastic involvement.



The session was streamed live on YouTube, and the link to access the session 3b is provided below.
Day-5(Session 5): https://www.youtube.com/live/IS2ltOGXi9Y?si=DyuZFYas0pCQBOnw

Overall Summary:

The Department of Civil Engineering, **MITS**, successfully organized a five-day **Faculty Development Programme (FDP)** titled *"Advances in Intelligent Civil Engineering (AICE 2025)"* from **10th to 14th September 2025**. The FDP brought together experts, academicians, and researchers to explore innovations shaping the future of civil engineering.

Through diverse sessions, the FDP addressed key themes:

- **Structural Health Monitoring & Sustainability** – ensuring long-term durability of infrastructure.
- **Advances in Materials & Geopolymers** – promoting eco-friendly and durable construction materials.
- **Water Resources & Sustainability** – frameworks for water security, resilience, and watershed health.
- **Smart Technologies** – applications of **IoT, AI, and remote sensing** in modern civil engineering.

Each session blended **technical insights, real-world case studies, and interactive discussions**, offering participants valuable exposure to both **theoretical advances** and **practical applications.**

The FDP emphasized that civil engineering is moving toward a **data-driven, technology-enabled, and sustainability-focused future**, encouraging participants to integrate intelligent solutions in their teaching, research, and professional practices.

Acknowledgements

The programme concluded with a **Vote of Thanks** and on a high note, united by a collective vision to advance civil engineering towards sustainability, intelligence, and resilience. The **Department of Civil Engineering**, MITS, extended the heartfelt gratitude to:

- ***All Resource Persons*** for their valuable time, expertise, and insightful contributions throughout the sessions.
- ***Faculty Members, Research Scholars, and over 240 Participants*** from various institutions across India for their enthusiastic engagement and active involvement.
- ***Session Chairs and Moderators*** for steering the discussions and fostering meaningful interactions.
- ***Programme Coordinators*** for their unwavering dedication in planning and ensuring the smooth execution of the event.
- Special thanks to the ***Hon'ble Vice Chancellor*** for his continuous support and for graciously inaugurating the programme.
- ***Management of MITS*** for their consistent encouragement and support in organizing this Faculty Development Programme (FDP).

Conclusion

The Department of Civil Engineering, MITS, successfully organized the **five-day FDP (10th–14th September 2025)** with the theme *"Advances in Intelligent Civil Engineering."*

Through expert lectures, live demonstrations, and interactive discussions, the programme emphasized the need for a **data-driven, technology-enabled, and sustainability-focused future** for civil engineering.

Participants left with enriched knowledge, new collaborations, and actionable insights to integrate **intelligent practices into teaching, research, and professional applications.** The FDP marked a significant step towards preparing civil engineers for the challenges of **smart cities, climate resilience, and sustainable infrastructure.**

Outcomes:

The five-day **Faculty Development Programme (AICE 2025: Advances in Intelligent Civil Engineering)** successfully achieved the following outcomes:

- ✓ Enhanced awareness among participants about cutting-edge applications of **AI, ML, IoT, and geospatial tools** in civil engineering.
- ✓ Strengthened understanding of **structural health monitoring, water resources, sustainability, and intelligent transport systems.**
- ✓ Provided **hands-on exposure** to remote sensing platforms, MATLAB applications, SWAT+ modeling, and bibliometric tools.
- ✓ Fostered **interdisciplinary collaboration** between civil engineering, computer science, environmental studies, and urban planning.
- ✓ Encouraged **faculty-researcher-student engagement**, motivating young professionals to explore innovative solutions in core engineering disciplines.
- ✓ Served as a platform to share **best practices, case studies, and policy-relevant frameworks** like the WISER model for water security.

Feedback from Participants: